Integrating Assistive Technology into Teacher Education Programs: Trials, Tribulations, and Lessons Learned

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Abstract: This article describes several stages in the integration of assistive technology (AT) into and across the curriculum of a teacher education program. The multi-year initiative included several projects and strategies that differentially affected faculty ability to integrate training and evaluation in using AT in their coursework. All strategies increased faculty familiarity and comfort with AT. However, only video tutorials resulted in faculty infusion of AT in their courses. Implications for teacher preparation programs, including the need to infuse assistive technology within and across coursework are discussed.

Key Words: Assistive technology, technology integration, higher education, professional development

Increasing the integration of AT into teacher education programs has been recommended by leading researchers and AT practitioners in the field (Bausch & Hasselbring, 2004; Edyburn, 2004; Judge & Simms, 2009; Parette, Peterson-Karlan, & Wojcik, 2005; Silver-Pacuilla, 2006). Preparing future teachers to use AT is necessary due to mandates that require them to be responsible for considering AT needs and services for all students receiving special education services (Individuals with Disabilities Education Improvement Act of 2004). Both special and general educators must be knowledgeable about AT so that they can assist in the consideration and selection of devices, software, and/or equipment while also having the necessary skills to provide AT services.

However, in order for teachers to meet these requirements, they must have the skills and knowledge to do so. Insufficient training on AT at the preservice level has been cited as a primary obstacle to achieving meaningful integration and use of AT for students with disabilities in school settings (Bryant, Erin, Lock, Allan, & Resta, 1998; Judge & Simms, 2009; Michaels & McDermott, 2003). According to Judge, Puckett, and Cabuk (2004) teacher familiarity, confidence, and skill in choosing software and integrating AT into the curriculum are dependent on training and time for technology exploration. The success and use of AT by students with disabilities is directly related to the AT knowledge and skills of their teachers (Judge & Simms) and teacher preparedness is the primary significant predictor of student AT use (Connor, Snell,

Gansneder, & Dexter, 2010). Although the importance of integrating AT into teacher preparation has been established, few universities provide certification or training in AT (Alper & Raharinirina, 2006; Bausch & Hasselbring, 2004; Lahm, 2005; Todis, 1996), and insufficient training has limited the number of teachers and therapists using AT in classroom settings (Bell, Cihak, & Judge, 2010; Judge, 2001).

To measure how AT is being integrated within teacher education programs across the U. S., two national surveys of special education teacher preparation programs were conducted within the last decade. In 2003, Michaels and McDermott surveyed program coordinators across a sample of institutions of higher education with graduate special education certification programs. They measured how coordinators currently integrated AT knowledge, skills, and dispositions within their programs and how they would ideally like to have AT integrated within their programs. Results indicated a significant difference between the AT integration currently being provided and what the coordinators reported as the ideal integration of AT within their programs. Most agreed that they were not doing an adequate job of preparing candidates to use AT in classroom settings. Inadequate training among teacher candidates was confirmed by Judge and Simms (2009) when they conducted a national survey of special education teacher preparation programs to determine how they addressed AT in their coursework. Results revealed that approximately one-third of undergraduate programs and less than one-quarter of master's programs required coursework in AT, which suggests that many teacher candidates enter the field without adequate knowledge and skills regarding AT. This is problematic especially considering that they will ultimately be required to identify AT devices and provide AT services for their students.

To address the need for providing instruction on AT in higher education, a few researchers have investigated different methods for integrating AT into teacher education programs. Some have investigated the use of multimedia-based instruction for teaching preservice teachers about AT (Blackhurst & Morse, 1996; Van Laarhoven et al., 2008; Wojcik, Peterson-Karlan, Watts, & Parette, 2004). Blackhurst and Morse (1996) evaluated the effectiveness of an AT module that incorporated videos and other hypermedia components for teaching three different groups of professionals about AT. Results indicated that undergraduate, graduate, and inservice professionals were satisfied with the instructional modules. Similarly, Van Laarhoven and colleagues evaluated the effectiveness of video tutorials (i.e., videos teaching learners how to use various AT) followed by hands-on experiences with the technologies, to teach preservice educators how to use AT. They reported significant increases in familiarity with AT, comfort level using AT, and perceived effectiveness and comfort with integrating AT into instruction for both special and general education majors participating in the study. In addition, participants indicated satisfaction with using the video tutorials as an instructional tool.

Wojcik et al. (2004) also described a model for teaching both special and general education teacher candidates to use AT. These authors described two delivery models: (a) an alternative track for elementary, middle, and secondary education teacher candidates; and (b) a traditional track for early childhood and special education candidates. In the alternative track, the researchers described an Instructional Technology Passport System (ITPS) that required teacher candidates to complete six online modules that included descriptions and images or short video clips depicting the use of AT in educational environments as well as links to Web-based resources. Once candidates passed the online

exams, they were also required to engage in hands-on experiences and pass competency exams using selected technologies.

In 2006, Jeffs and Banister evaluated the benefits of having faculty from general and special education programs collaborate to develop assignments within undergraduate technology classes. In this investigation, special education candidates taught general education counterparts about various AT, and the general education majors taught special education majors to use various types of multimedia. Results indicated that both groups gained skills and knowledge in using multimedia and AT.

It appears that using instructional modules on AT, collaboration between general and special education faculty, and online modules or video tutorials used in conjunction with hands-on experiences are effective models for integrating AT into teacher education programs. However, the research base is limited, and much more research regarding effective methods, models, and strategies for systematically integrating AT into special and general education preservice programs and related fields is warranted to close the gap between the need for, and supply of, qualified teachers and therapists.

Typically, teacher education programs infuse AT into the curriculum by providing students with a basic overview of AT in introductory courses, offering a single course on AT that is required or offered as an elective, or they rely on individual faculty to integrate AT into their coursework (Judge & Simms, 2009; Michaels & McDermott, 2003). Many researchers (e.g., Bausch & Hasselbring, 2004; Family Center on Technology and Disability, 2008; Judge & Simms, 2009; Lahm & Nickels, 1999; Smith, 2000) have recommend infusing AT instruction across the special education curriculum. This approach involves integrating AT knowledge, skills, and practice across the sequence of courses in the teacher preparation curriculum (Michaels & McDermott, 2003). An integrated approach provides repeated exposure of AT to increase teacher candidates' familiarity, comfort, and skill in using technologies and therefore emphasizes the importance of supporting students' use of AT in classroom settings. Such repeated exposure across courses and technologies increases the likelihood that teacher candidates will attain the skills necessary for selecting, supporting, and using AT effectively with their future students, particularly if hand-on experiences with assistive technologies are provided (Alsalem, 2010).

Although researchers recommend the integration of AT throughout teacher preparation programs, several factors make this approach difficult to implement including (a) lack of faculty expertise with AT; (b) limited space in the curriculum for additional content; (c) lack of resources (e.g., hardware, software, devices); and (d) the perception that AT is only used with a limited number of students. These and other issues often make AT infusion a low priority in teacher education programs (Judge & Simms, 2009; Michaels & McDermott, 2003). Clearly, in order for the infusion of AT to become a reality within teacher education programs, faculty must not only value the inclusion of AT in the curriculum, but they also need to strategically consider its integration across courses within the program sequence. This proposition can be difficult, however, if faculty do not have the expertise or desire to provide instruction on AT. This is especially problematic if the integration of AT requires additional professional development and investment of time on the part of faculty.

One of the largest barriers in effectively integrating AT into teacher preparation is lack of faculty expertise (Bryant et al., 1998; Michaels & McDermott, 2003). To overcome

this barrier, researchers have suggested (a) hiring faculty with expertise in AT (Michaels & McDermott); (b) retraining existing faculty and providing incentives for faculty to infuse AT into the curriculum (Judge & Simms, 2009); (c) providing a course release or sabbatical for faculty to redesign or develop courses in AT (Bryant et al.); or (d) pairing tech-savvy students with reluctant faculty members (Smith, 2000).

This paper will present one institution's experience with increasing faculty expertise with AT over a period of several years, through a variety of projects and strategies that focused on AT alone, or in combination with other recommended practices for inclusive classrooms. Specifically, this paper will describe three strategies that were used to support faculty development and integration of AT throughout teacher preparation programs at a major Midwestern university, and the effectiveness of each strategy based on faculty members' reported perceptions and outcomes.

The Institution and Programs

Faculty in special education (Cross-Categorical) and general education (Early Childhood, Elementary Education, Secondary Education) programs in a large, state university in Illinois participated in this project. The special education program led to certification as a K-12 Learning Behavior Specialist (LBS-1), and was separate from certification programs for visual and hearing impairments. Initiatives in the special education program designed to provide teacher education candidates with AT knowledge and skills was expanded to also include other teacher certification candidates. Resources for these initiatives came from a variety of sources, including the College of Education, Faculty Development Grants from the University, and a multi-year grant from the Illinois Council on Developmental Disabilities.

Stages and Initiatives in AT Integration

Prior to AT integration initiatives in the LBS-I program, few faculty had experience or expertise with AT. As a result, candidates' hands-on experiences with AT were primarily limited to methods courses associated with instructing individuals with significant disabilities, a common characteristic among teacher education programs nation-wide (Judge & Simms, 2009; Michaels & McDermott, 2003). Professors of those courses borrowed and brought various AT to class which proved to be both inconvenient and time consuming. Faculty in other special education courses were encouraged to address AT however, they primarily did this by bringing their classes to the small AT lab and asking other faculty or graduate assistants with AT expertise to present to their classes. Few faculty members were able to demonstrate AT in their own classes or to supervise hands-on experiences within the AT lab. Simply providing access to AT did little to increase faculty use of expertise with AT.

Stage 1: Initial Efforts to Infuse AT into Courses

In 2002, two special education faculty (first and second authors) received a four-year grant from the Illinois Council on Developmental Disabilities to enhance the preparation of special and general education preservice teachers for inclusive classrooms. Project Achieving Creative & Collaborative Educational Preservice Teams (ACCEPT) involved multiple curricular enhancements, including purchase of AT and expanded preparation for their use. Some grant funds were used to purchase AT that could provide support for learners with both high and low incidence disabilities. Initially, only five licenses of various AT software were purchased and these were loaded onto a desk

top computer in a small office, a laptop that was used to conduct demonstrations of AT in education classes, and project staff's computers. Preservice educators from special, elementary, early childhood, and secondary education who participated in the Project ACCEPT course were required to engage in hands-on activities with all of the software and devices. Project staff also provided demonstrations in additional methods courses by 'co-teaching' with faculty to ensure that all preservice educators received instruction on universal design for learning (UDL) and AT.

As part of this project, AT was introduced in select special education courses and several early childhood, elementary, and secondary education courses. Preservice candidates and course instructors from targeted courses received instruction on UDL and information about AT. Follow-up surveys assessing the project's effectiveness indicated that preservice teacher's knowledge of AT increased substantially (Van Laarhoven, Munk, Lynch, Bosma, & Rouse, 2007). Similarly, during their first year of teaching, participants reported hands-on experiences with AT as one of the greatest benefits of the project (Van Laarhoven et al., 2006). Based on the results of this project as well as their belief that candidates would benefit from learning specific AT associated with content in coursework and clinical experiences, special education faculty made the infusion of AT into additional courses a priority.

Stage 2: Expanding the AT Lab

The success of Project ACCEPT made it clear that more AT was needed to accommodate the increasing number of faculty and students who wanted AT included in their courses. The Department of Teaching and Learning provided funding to purchase additional software licenses and these were placed on 10 computers in the College of Education's Learning Center. However, space was limited and it was difficult to accommodate a large number of students at one time. As a result, the development of an open AT lab that could provide hands-on experiences for approximately 850 candidates (throughout the year) became a funding priority within the College. In January, 2004, a second AT lab was opened, and was primarily funded through private donations and grant funds. This lab was equipped with 25 desktop computers which were replaced in 2006 and again in 2010. A mobile cart with 14 laptop computers was also purchased to accommodate large class sizes and to provide instruction in off campus locations or when the lab was in use. Additional software licenses, devices (e.g., AAC devices, switches), and recently, mobile technology devices (e.g., iPods, iPads), were obtained through course fee accounts as well as funded grants.

Once the challenge of developing and equipping a dedicated AT lab was met, the next challenge was improving the knowledge and skills of faculty so that they could integrate AT into their own courses, rather than relying on a few select faculty to do this for them. The remainder of this paper focuses on strategies that were implemented to support faculty integration of AT within the teacher education program.

Stage 3: Strategies to Increase Assistive Technology Integration Among Faculty

Three strategies were employed to improve the efficacy of our teacher educators: (a) co-teaching arrangements, (b) faculty development opportunities, and (c) development and use of written and video-based tutorials. Each of these strategies is described in the following sections.

Co-Teaching Arrangements (2002-2004)

Description. During the initial years of Project ACCEPT, the two faculty coordinators and

project staff worked collaboratively, in a co-teaching model, with other faculty to provide demonstrations and hands-on experiences with AT for students in methods and field experience courses. Faculty from each of the teacher preparation program areas participated: Early Childhood (general and special education methods courses); Elementary Education (Science, Social Studies, Reading, and ELL courses; and Field Experiences); Special Education (Foundations, Collaboration, High and Low Incidence courses; and Field Experiences); and Secondary Education (Biological Sciences, History, and English courses; and Field Experiences). The co-teaching model was designed to have project staff provide the majority of initial instruction on AT during class sessions and for course instructors to supplement AT instruction and practice in subsequent sessions. The goal of the co-teaching model was that course instructors eventually would be responsible for providing all AT instruction in their courses.

Effectiveness and outcomes of co-teaching arrangements. Although co-teaching experiences allowed for more integration of AT into the teacher education program, and faculty reported satisfaction with co-teaching arrangements, this model could not be sustained. Project staff were not able to shift responsibility for teaching AT to primary course instructors and faculty often relied on graduate assistants to work with candidates in the AT lab. As a result, faculty members' expertise and comfort levels with AT did not increase. In addition, project ACCEPT faculty could not continue to provide AT instruction in multiple sections of multiple courses and also maintain their own teaching load.

Evaluation of co-teaching revealed two findings. First, while faculty recognized the importance of integrating AT into their courses, they did not take the initiative to develop expertise with AT, preferring instead to rely on project staff. Second, as a result, faculty were unable to participate in co-teaching in a meaningful way and, more importantly, they were unable to sustain the integration of AT into their coursework after the co-teaching sessions ended. Evaluation and reflection on the effectiveness of co-teaching suggested that although faculty demonstrate positive dispositions toward AT and co-teaching, those traits do not predict the development of expertise with AT. Clearly, faculty require a more intensive experience in which they learn how to use AT with some proficiency before they can integrate it within their own courses. Hands-on workshops were identified as a strategy for enhancing faculty expertise.

Faculty Development Opportunities (2004-2005)

To encourage faculty members to take a more active role at integrating AT into instruction, two faculty development opportunities were offered. The first involved a full-day workshop and the second involved a five-day workshop focused solely on AT.

Description of full day workshop: Overview of universal design and introduction to AT. Program faculty who were participating in Project ACCEPT were invited to participate in a full day workshop that addressed methods for supporting learners with disabilities in inclusive classrooms such as differentiated instruction, UDL, and AT. Faculty received instructional materials to use in their courses (topic modules), and were allowed to purchase AT to integrate into their courses. Eighteen faculty from a variety of teacher preparation programs participated. They received a small stipend to attend the workshop and integrate AT content into their courses.

Effectiveness and outcomes of the full-day workshop. Although several faculty members integrated some of the workshop content into their instruction (e.g., simulation experiences,

UDL), and reported satisfaction with the workshop, only two of the 18 participants (11%) independently integrated AT into their coursework. The other faculty continued to request assistance from ACCEPT staff to provide demonstrations in their courses. These results indicate that a one-day workshop with some hands-on experience did not provide sufficient support for faculty to feel confident in independently integrating the technologies into their instruction. Therefore, project staff, and other special education faculty, decided to offer more intensive and extended instruction on assistive technology.

Description of the five-day workshops on AT. To provide more in-depth instruction on AT for faculty, the first three authors obtained funding from two internally-funded grants to offer five workshops on AT during the summer of 2004. The workshops provided faculty with extensive hands-on experiences using AT and participants also received written AT tutorials to use with students in their own courses.

Effectiveness and outcomes of five-day workshop. An email describing the workshop was sent to faculty across the university who had participated in any of the Project ACCEPT opportunities (e.g., co-teaching, full-day workshop) as well as other faculty in the College of Education. Seven faculty and one student participated in the workshops. To measure the effectiveness of the faculty development workshops on faculty integration of AT, participants completed two surveys (i.e., *Familiarity and Comfort Level with AT; Current level of AT Integration*) prior to and one year following the workshops. The first survey, Familiarity and Comfort with AT survey, measured faculty members' familiarity, comfort level, and perceived effectiveness in using and integrating AT within their courses. Table 1 presents the items on this survey. The second survey, *Current Level of AT Integration* survey, measured faculty members' current level of AT integration prior to and one year following workshops. Table 2 presents the items for the *Current Level of AT Integration* Survey.

Design and instrumentation. A pretest, posttest design was used to assess the effects of the five-day faculty development opportunity on participating faculty members' familiarity, comfort level, and perceived effectiveness in using AT. Participating faculty members were given a *Familiarity and Comfort with AT* survey that consisted of 40 statements regarding general technology or AT, and instructions to rate their level of agreement with each statement by marking a number on a 6-point scale (i.e., 1 = strongly disagree, 3 = somewhat disagree, 6 = strongly agree). Individual items and survey subscales appear in Table 1 and the survey instrument is available from the first author.

Results of faculty development workshops as measured by the familiarity and comfort with AT survey. Table 1 presents the pretest and posttest scores and significance of difference for each of the items and subscales. Overall, the results indicated that the faculty development workshops were effective at increasing faculty members' familiarity, comfort level, and perceived effectiveness with using AT. Results for individual survey items reflected small to large effect sizes for the workshops and pre-post scores focusing on AT indicated significant gains for each item with the exception of Overall Integration of AT into Instruction. Significant gains were made with Overall Familiarity with AT ($F_{(1,6)} = 6.25$, $p < .047$), Overall Comfort with using AT ($F_{(1,6)} = 20.25$, $p < .004$), and Overall Comfort with Teaching AT ($F_{(1,6)} = 10.50$, $p < .018$). Overall Integration of AT into Instruction, however, did not result in significant findings ($F_{(1, 6)} = 3.69$, $p < .103$).

The magnitude of growth from pre- to post- was analyzed using partial η^2 (Cohen, 1988),

Table 1
Familiarity and Comfort with AT Survey: Comparisons of Pretest and Posttest Survey Responses

Individual Items	Pretest		Posttest		Sig.		η^2	Effect size	
	M	*SD*	*M*	*SD*	*df*	*F*	*p*		
Overall familiarity with general technology	5.71	.48	5.71	.48	1, 6	.00	1.00	.000	Small
Overall comfort with using general technology	5.14	1.21	5.57	.53	1, 6	1.35	.289	.184	Large
Overall comfort with teaching general technology	4.29	1.38	5.14	.38	1, 6	2.07	.200	.257	Large
Overall familiarity with AT	4.14	1.07	4.86	.69	1, 6	6.25	.047	.510	Large
Overall comfort with using AT	3.29	1.11	4.57	1.13	1, 6	20.25	.004	.771	Large
Overall comfort with teaching AT	3.00	1.15	4.00	1.53	1, 6	10.50	.018	.636	Large
Overall integration of general technology into instruction	3.71	1.80	4.86	.90	1, 6	2.21	.188	.269	Large
Overall integration of AT into instruction.	3.14	1.22	3.71	1.25	1, 6	3.69	.103	.381	Large
Subscales									
Familiarity with specific AT (8 items)	3.00	1.01	4.34	1.04	1, 6	12.71	.012	.679	Large
Comfort with using specific AT (8 items)	2.73	.92	3.91	1.11	1, 6	12.71	.012	.679	Large
Perceived effectiveness and comfort with integrating AT into instruction (6 items)	2.90	1.17	3.79	1.33	1, 6	12.30	.013	.672	Large
Importance of AT in education (8 items)	5.79	.28	5.83	.18	1, 6	.30	.604	.048	Small

6-point scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Somewhat Disagree, 4 = Somewhat Agree, 5 = Agree, 6 = Strongly Agree

which represents the difference between the pretest and posttest scores, divided by the standard deviations. The following scale was used to interpret the magnitude of an effect: η^2 = .01 = small effect; η^2= .06 = moderate effect; and η^2= .14 = large effect. Partial η^2 values reflecting large effect sizes were found for items that focused specifically on AT, including Overall Familiarity with AT (. 510), Overall Comfort with Using AT (.771), Overall Comfort with Teaching AT (.636), and Overall Integration of AT into Instruction (.381). Pretest to posttest scores on items focusing on general technology suggested no significant gains; however, partial η^2 scores indicated large effect sizes for items that focused on Overall Comfort Using Technology (.184), Overall Comfort Teaching General Technology (.257), and Overall Integration of General Technology into Instruction (.381). Additionally, relatively lower effects on general technology, versus

AT items might be expected given that the workshops focused specifically on AT and faculty may have had much more prior experience in using general technology (e.g., word processing, email).

Results for the subscale, Familiarity with Specific AT, indicate that faculty gained enough information regarding specific devices (e.g., switches) and programs (e.g., software for reading challenges) to report high levels of familiarity ($F_{(1,6)}$ = 12.71, p < .012). This suggests that the workshops provided adequate levels of instruction for specific devices and software to allow faculty to be familiar with what devices are available and for whom they would benefit. Results for the subscale, Comfort with Using Specific AT, suggest that faculty received enough instruction and hands-on experiences with specific devices and software to feel comfortable using those items ($F_{(1,6)}$ = 12.71, p < .012). Given that comfort level is a predictor of whether teachers will adopt a new strategy in their classrooms, this finding is encouraging.

Results for the subscale, Perceived Effectiveness and Comfort with Integrating AT into Instruction, suggest that faculty gained confidence in their ability to integrate content on AT into their coursework ($F_{(1,6)}$ = 12.30, p < .013). This finding was very promising as the goal of the workshops was to encourage faculty to integrate AT into their instruction. Results for the final subscale, Importance of AT in Education, did not result in significant findings ($F_{(1,6)}$ = .30 p < .604 perhaps because faculty had prior understanding and appreciation for AT, and the belief that both special and general educators should integrate AT into their instruction.

Partial η^2values revealed a large effect size for Familiarity with Specific AT (.679), Comfort with Using Specific AT (.679), and Perceived Effectiveness and Comfort with Integrating AT into Instruction (.672). A small effect was observed for the subscale of items addressing Perceived Importance of AT in Education (.048). However, the smaller effect may be attributed to the fact that faculty came in to the workshops with positive attitudes toward the use of AT in instructional settings.

Results of faculty development workshops as measured by the current level of integration survey. Faculty were given a 17-item survey with statements related to different methods for integrating content on AT into instruction. The first 16 items provided statements, while the 17th item offered a write-in response for 'other,' however, faculty did not respond to this item. Faculty were asked to indicate how often they used the described methods by selecting from the following scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, and 5 = Always. Results are presented in Table 2.

Modest increases were reported for all of the strategies except question 8 (use of guest lecturers). However, ratings indicate that none of the integration strategies were utilized more often than 'rarely' or 'sometimes.' Items 11-13 most directly assess the faculty member's expertise with integration, and ratings for these items suggest that faculty rarely provided demonstrations of the AT in their own courses, which may explain, in part, why they did not require their students to complete assignments that involved the actual use of AT to produce an outcome or product. Although it was promising to see an increase in the provision of hands-on experiences, in most cases, faculty provided hands-on experiences following a demonstration by guest lecturers.

Table 2
Results of Current Level of AT Integration Survey.

	Individual Items	*M* Pretest	*M* Posttest
1.	I cover AT in my coursework by assigning readings on the topic.	3	3.33
2.	I cover AT by providing students with links to websites, or by having them find relevant websites on their own.	3.33	3.33
3.	I test my students on their knowledge of the laws related to AT.	2.33	2.33
4.	I test my students on their knowledge of specific types of AT (e.g., switches, writing software) that can be used for a variety of learning challenges.	2.5	2.8
5.	I provide information on AT through lecture.	3.17	3.67
6.	I actively seek out information on AT to incorporate the information within my courses.	3.17	3.5
7.	I provide information on AT by showing videos on the topic.	2.67	3.17
8.	I provide information on AT through guest lecturers who *describe* or lecture on the topic.	2.67	2.5
9.	I provide information on AT through guest lecturers who *demonstrate* AT.	3	3.17
10.	I provide information on AT through guest lecturers who provide hands-on-practice with the technologies.	3	3.33
11.	I personally provide brief demonstrations on how to use AT software/devices.	2.33	2.67
12.	I demonstrate AT in my own courses & also act as a guest lecturer for others.	2	2.17
13.	I provide my students with hands-on practice with AT.	2.67	3.83
14.	I assign homework that requires students to write about AT (e.g., papers) or to describe how they would incorporate AT into lessons.	2.33	3
15.	I assign homework that requires students to demonstrate the use of AT.	1.83	2.67
16.	I assign homework that requires students to submit products developed with AT (e.g., picture schedules).	1.67	1.83

Scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, and 5 = Always

Outcomes and effectiveness of five-day workshop. Together, the results of the two surveys suggest that the extended workshop strategy was effective for increasing the participants' familiarity and comfort with AT, as well as their confidence in integrating AT into their courses. However, as was observed for the earlier strategies that provided access to the AT lab and co-teaching experiences with project staff, generally positive perceptions of AT integration did not necessarily result in faculty expanding their expertise in demonstrating AT and including assignments that required hands-on experiences with their students.

The disparity between reported comfort and confidence with AT integration and assuming responsibility for developing expertise and demonstrating AT within courses was further highlighted in the outcome data for the workshops. While faculty were able to articulate how AT could, and should be integrated into instruction, they were not demonstrating AT for their students, nor were they creating assignments that would provide hands-on experiences. For that expertise, they continued to rely on project staff. Observation and informal discussion with participating faculty, combined with the results of previous strategies, suggested that a next step should include 'tutorials' to support faculty both in, and outside of, the classroom. Tutorials would allow faculty to develop expertise at convenient times, and would also provide them with actual exercises they could assign to their students.

Written and Video-Based Tutorials (2005-Current)

Because faculty members still indicated discomfort with integrating AT into their coursework and continued to request demonstrations from ACCEPT staff, it was necessary to plan for sustainable support when Project ACCEPT ended. For this reason, video tutorials of all of the AT available in the lab were developed and placed on a DVD entitled, *The Encyclopedia of Assistive Technology* (EAT). The tutorials include videos depicting software programs and/or devices that support individuals who have difficulties with written language, reading, math, communication, study skills, and/or physical control of their environment. The tutorials have several features that include an overview of the program/ device, videos depicting critical components of the program/devices, short tutorials (video-based and written) for using the program, and a list of resources. All featured AT devices and software are categorized by the type of support they provide (e.g., written language) or by the type of product (e.g., AAC, environmental control). Once a category is selected, a drop down menu of available software/devices in the program appears and the user then selects a product. After the program or device is selected, a description of the product appears and the user selects one of the features from the features toolbar to learn more about the product. Essentially, the DVD provides videos that teach learners 'how to' use various technologies (similar to the popular 'Video Professor' CDs sold commercially). It is available online at http://at-video-tutorials.com/

These tutorials were intended to provide faculty with a tool that allowed them to demonstrate AT by loading a DVD into a computer and presenting video sequences of a variety of AT during their instruction or by having teacher candidates access them independently. The tutorials also provided written and video lessons for students to use for hands-on experiences and also offered candidates supplemental information through links to helpful resources. Thus, faculty were provided with content on AT without having to gain expertise themselves in order to provide instruction on AT to preservice teachers. The video-based tutorials made it possible for faculty to integrate the technologies into their coursework with very little effort or training.

Outcomes and effectiveness of video tutorials. Video tutorials were distributed to faculty members in Spring of 2006. To evaluate the effectiveness of video tutorials to support the integration of AT for faculty, a post-only design was used and these results are presented in Table 3. Twelve surveys were sent to full-time and adjunct faculty who used the tutorials and nine were completed and returned for a response rate of 75%. Faculty and instructors who used the tutorials for a year were asked to complete a 20-item survey

Table 3
Results of Video Tutorial Evaluation Survey

Satisfaction with Video Tutorial	*N*	*SD*	*M*
Overall Satisfaction with Video Tutorials	9	.17	4.89
Satisfaction with Components of Video Tutorials	9	.17	4.89
Usefulness of Video Tutorials	9	.00	5.0
Benefits/Effects of Using Video Tutorials	9	.36	4.72
How Video Tutorials were Used	***N***	***N* of faculty using this method**	**% of faculty**
Candidates viewed tutorials independently without hands-on practice	9	1	11
Candidates viewed tutorials independently followed by hands-on practice	9	7	78
Tutorials were shown through a projector without hands-on practice	9	1	11
Tutorials were shown through a projector followed by hands-on practice	9	6	67
Used tutorials to practice skills prior to demonstrating in class	9	7	78
Other: Used video tutorials for students to make up assignments if absent	9	1	11

Scale for satisfaction: 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree. Responses for how tutorials were used = yes/no

to evaluate the video tutorials and their components.

The first 13 items of the survey included statements about the video tutorials and faculty were asked to indicate their agreement/disagreement with each statement using a 5-point rating scale (1 = strongly disagree; 5 = strongly agree). Rating scale items were categorized into four subscales for analysis and included: (a) Overall Satisfaction with Tutorials (3 items); (b) Satisfaction with Components on Tutorials (i.e., overview videos, critical content videos, short tutorials, and resource section; 4 items); (c) Usefulness of Tutorials (3 items); and (d) Benefits/Effects of Tutorials (2 items). Six additional items, five of which required a yes/no response, asked faculty to indicate how they used the tutorials with teacher candidates. The sixth item was listed as 'Other' and required a written response. These six items were included in the survey to determine how faculty used the tutorials to present AT in their courses. The final item on the survey was an open-ended question asking faculty to provide feedback and suggestions for improvement. This information was used to refine the tutorials and all comments were

coded as being 'positive,' 'negative,' or 'constructive.'

Results of video tutorials. Of the nine faculty who completed the survey, all agreed or strongly agreed that they were satisfied with the tutorials and found them useful and beneficial for teaching preservice educators to use AT. For the first and second subscales, Overall Satisfaction and Overall Satisfaction with Components of the Tutorials, respectively, most faculty strongly agreed that they were satisfied with the tutorials (M = 4.89 on a 5-point scale). All faculty strongly agreed the video tutorials were useful (M = 5.0), and most indicated they were beneficial and effective (M = 4.72).

When asked to indicate how they used the tutorials, the majority of faculty (78%) indicated that they required candidates to view the tutorials independently followed by hands-on practice with the technologies. Seventy-eight percent also indicated they used the tutorials to practice their own skills prior to demonstrating in class. Sixty-seven percent of faculty used the tutorials by projecting the videos on to a screen in class followed by hands-on practice. Only one faculty reported requiring students to independently view the tutorials outside of class and projecting the videos in class without hands-on practice; however, this faculty member reported that this only occurred in courses in off-campus locations. Only one faculty reported using the tutorials for make-up sessions when students missed in-class demonstrations. Most faculty reported using the tutorials in more than one way. The most common combination reported by 56% of faculty involved requiring students to view the tutorials independently followed by hands-on practice, projecting the videos on screen during class followed by hands-on practice, and reviewing the tutorials independently prior to demonstrating them in class.

Faculty provided a total of 11 written comments and they were coded as positive, negative, or constructive. Results indicated that 64% of comments were positive and included statements such as, "The tutorials were extremely useful," "These videos were a great supplement to the content of the course! I don't think I could have covered AT in my course without these," or "I used these for two courses and they were wonderful. The students loved them!" One faculty provided a negative comment (9%) stating that, "Some of the videos seemed a little dark." The remainder of the comments were coded as constructive (27%) and included statements such as, "I recommend that students read the tutorial print before watching the video or having the print copies to follow along," or "Could you add a component where teachers, parents, and students talk about specific AT? They could explain how item works for them and how they use it." In general, faculty provided positive responses to using the video tutorials and continued to use them with students.

Discussion on use of video tutorials. Creating an interactive video-based product requires an incredible amount of time and dedication. Though time intensive to develop, video tutorials appear to be an effective tool for supporting faculty and for integrating AT into teacher education programs. Not all faculty are confident in their ability to use or demonstrate AT and the video tutorials provide them with an opportunity to demonstrate AT devices and software without fear of making an error in front of students. They also provide 'on-demand' refreshers for faculty who want to practice their skills prior to demonstrating in class. In addition, the tutorials have been invaluable for supporting new and adjunct faculty with limited or no prior exposure to AT. Without the video tutorials, professional development opportunities would need to be provided on an ongoing basis, which could also be time-

consuming and potentially ineffective. Most important, results of previous research has also indicated that the use of video tutorials is an effective strategy for increasing the familiarity, comfort level, and perceived effectiveness of integrating AT into instruction for both special and general education majors (Van Laarhoven et al., 2008), which will hopefully increase the use of AT with their future students.

How AT is Integrated into the Teacher Education Program at Northern Illinois University

In order to integrate AT throughout the teacher education program, participating faculty engaged in curriculum mapping activities following the workshops to identify specific AT that supported or were relevant to content being taught in various special education undergraduate methods courses. The resulting document listed courses and their corresponding AT and thus displayed how AT would be integrated throughout the program. This matrix is available from the first author. All teacher candidates now are introduced to AT during early coursework and are later required to complete AT proficiency checkouts during early clinical experiences. Content on AT is typically introduced in class and followed by hands-on experiences in the AT lab. General education programs integrate AT across two or three courses whereas special education programs integrate AT across seven-eight methods courses across different content areas (e.g., collaboration, reading, multiple disabilities). Throughout the program, preservice candidates are expected to demonstrate proficiency of selected AT in several different courses and are encouraged to use AT in corresponding field-based experiences. Recent surveys of our special education candidates indicate that they are satisfied with how AT has been integrated throughout the program. Candidates reliably indicate that instruction on AT is important; they believed they were well prepared to use AT with students in classroom settings, and they were familiar with and comfortable using various AT (Van Laarhoven & Conderman, 2011).

Outcomes and Benefits

This purpose of this paper was to describe stages in the integration of AT into the curriculum of a teacher education program in the College of Education at Northern Illinois University. The multi-year initiative was comprised of multiple projects and strategies funded by several grants and support from the College of Education. The evolution of the strategies, from providing demonstrations in a variety of courses across the teacher education program, to development of tutorials to guide both faculty and their students was not pre-determined, and in fact, was the product of a recognizable cycle of innovation followed by evaluation and response in the form of more innovation.

The trials and tribulations experienced throughout the roughly 10 years of work summarized here yielded several important findings, including the repeated evidence that professional development that exposes faculty to AT and provides information and demonstration on its integration can positively influence perceptions of AT. All of the strategies, from a visit to the lab to a five-day workshop, enhanced familiarity and comfort with AT. We might infer from these findings that faculty with expertise with AT and a goal of promoting its integration can positively influence colleagues. However, the collective findings also suggest an ongoing reliance on the 'experts' to provide demonstrations and hands-on activities for the preservice educators in special and general education programs. This reliance was necessary because the novice faculty had not developed the level of proficiency with the AT necessary to demonstrate for their classes, and as a result, had not conceptualized hands-on assignments

for their students. Thus, as has been demonstrated with in-service teachers, a change in attitude and disposition did not produce a change in actual practice.

The chronology of strategies concludes with video tutorials, which were designed to address the need for faculty (and students) to learn about and practice using AT outside of the classroom, and to provide activities that prompted the use of the important features of each tool or device. Reports by faculty indicated gains in proficiency and sustained independent use, presumably because the video tutorials were conveniently available and provided modeling and guided practice, along with actual exercises for using AT. The final step to address the integration of AT in teacher preparation programs was to distribute content and practice across the curriculum. This assures that programs are introducing AT content early and providing opportunities for candidates to develop knowledge and become proficient in using AT with students with disabilities in classroom settings.

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